

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in and relating to a Treatment Apparatus for Static or Dynamic Treatment of the Spinal Column

I, VERNER CHRISTENSEN, a subject of the King of Denmark, of 1 Lille Torv, Thisted, Denmark, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to apparatus for static or dynamic treatment of the spinal column and for supporting the spinal column in its normal curved position.

The term static treatment is intended to refer to the use of the apparatus as an orthopaedic aid in maintaining or improving the static conditions of the spinal column of the patient, i.e. the posture, the apparatus being constructed in such a manner that the extent and the degree of the support which it affords can easily be adapted to meet the requirements of any spine under any conditions.

The term dynamic treatment is intended to refer to the use of the apparatus as a physical therapeutic remedy. By variation in the pressure applied by the apparatus against the spinal column a massaging effect can be obtained, serving to reduce muscular contractions and to change the internal pressure conditions of the intervertebral discs.

At the present when it is desired to support the spinal column of a patient, wrapped-up blankets, pillows or the like are used. The degree of support afforded by pillows or the like is of a fortuitous character and changing said support is often most painful and even dangerous to the patient. Furthermore, if it became advantageous to make a change or adjustment to such a support, making such a change or adjustment might ruin the benefit already obtained therefrom.

Apparatus according to the present invention comprises an inflatable bladder consisting of a gas impermeable material and provided with air supply means, a cover consisting of inextensible material, which cover may be so adjusted that, when the bladder is inflated, it may form cylindrical bodies of different diameters. This

apparatus offers the advantage that it can be used for static as well as for dynamic treatment of the spinal column and that, in a simple embodiment, it may be adapted for use with any patient and furthermore may be adjusted to suit varying requirements during the progressive treatment of a patient. The use of the inextensible material for the cover ensures that the apparatus can be given a definite maximum diameter, its hardness being afterwards regulated by the air pressure in the bladder irrespective of the diameter thereof.

The bladder which may be made from any suitable pliable gas impermeable material, may be in a form similar to that of a football bladder incorporating a flexible inlet tube which may be closed by bending over, but it is an object of the invention to provide air supply connecting means comprising a supply tube with a one-way valve permitting air to be blown into the bladder, but preventing air from unintentionally escaping therefrom. One-way valves of this kind are known *per se*.

According to the invention however, the valve is arranged so that it may be controllably opened to release air from the bladder. This may be of importance when the treatment apparatus is to be used for the dynamic treatment of the spinal column without the patient being moved.

In one embodiment of the invention the one-way valve for the release of the air comprises a cylindrical outlet tube of a rigid material, inside which is provided a rubber tube to cover and seal a hole in said outer tube. An opening member is provided in the hole of the outer tube which member may be actuated to move the rubber tube out of contact with the inner wall of the outer tube, thereby allowing air to escape through the hole.

Alternatively the one-way valve may be in the form of a ball valve in which a ball in known manner is held pressed against a seat by the pressure of air in the bladder. The valve may be provided with an operation member, by which the ball may be raised from

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its seat so that the air may escape.

The bladder may be coupled to a manually operated air pump, e.g. a pair of bellows, which may be operated by the hands or the feet and which, together with the bladder and a suitable coupling form a closed circuit. With such an arrangement the patient may, himself, adjust and vary the pressure of air within the bladder. Alternatively a single bellows may be provided which is so arranged that upon movement in one direction it will cause a decrease in the air pressure in the bladder and upon movement in the opposite direction it will cause an increase in the air pressure in the bladder within the limit defined by the inextensible cover.

The cover may be formed from a piece of substantially inextensible fabric, for example stiff linen, which may be made to define a cylinder around the bladder and which at adjacent edges is provided with adjustable fastening means, which may be formed by cord holes with cords passing therethrough, or by buckles along one edge and straps along the other edge or maybe by tape along both edges.

The static or dynamic treatment of the spinal column may be combined with heat treatment, and to this end there may be provided in combination with the cover, a heating element, for example consisting of electric resistance wires woven into the cover. The adjustment of the temperature may be effected in the usual way by means of a variable resistance or a variable transformer, if necessary controlled by a thermostat.

An example of the invention is now described with reference to the accompanying drawing in which:—

Figure 1 shows a deflated bladder for an apparatus according to the invention;

Figure 2 is a cover for the bladder in Figure 1, but on a smaller scale;

Figure 3 an example of a pumping device for use in connection with the treatment apparatus according to the invention and shown in section; and

Figure 4 a special embodiment of a ball valve for use in connection with the apparatus according to the invention, shown on an enlarged scale.

A bladder 1 may be formed as a closed rectangular rubber bag of for example 12 cms by 27 cms. In one corner an inlet is provided in the form of a rubber tube 2, in which a nipple 3 may be inserted which in figure 1 for the sake of clarity is shown slightly removed from the rubber tube 2 and which is externally grooved for providing a firm engagement in the rubber tube 2 and which internally has a conical passage into which fits a conical plug 4 or a coupling member 5 as shown in Figure 3. The coupling member 5 is adapted to be inserted into a rubber tube 6 which forms part of the air supply connecting means incorporating a one-way valve comprising a tube 7 of

rigid material, inside which are mounted a rubber tube 8 and an opening member 9 which lies so as to be in contact with the outside of the rubber tube 8 and the inside of the tube 7. The opening member 9 is provided with a part 10 which projects through an opening in the tube 7 and which, when subjected to a pressure in the direction towards the axis of the tube 7, allows air to escape through the opening, if an elevated pressure prevails inside the tube 7.

An elevated pressure can be provided by means of a pump formed by a rubber bag 11, which at one end has an inlet opening 12 closed by a valve 13, for example a rubber disc, which, when subjected to a pressure from inside the bag, rests against a seat and closes the inlet 12, while in the case of a reduced pressure inside the bag, it is released from the seat and permits an inflow of air. The bag 11 is furthermore provided with an air outlet which is in communication with the tube 7 and in which a valve 14 is mounted corresponding to the valve 13, but so arranged that it opens in case of an elevated pressure in the bag 11 and closes when there is a reduced pressure therein.

Alternatively the one-way valve may comprise a ball valve as shown in Figure 4, which ball valve consists of a body 15 with a bowl-shaped valve seat 16, a valve body 17 in the form of a ball and an opening member formed by a pressure plate 18 which by means of a pressure rod 19 guided by a cylindrical guiding body 20, can lift the ball 17 from its seat 16. The upper end of the valve is connected to the rubber tube 2 in Figure 1, while its lower end is connected to an air pump or a similar air supply member through a rubber hose pulled in over the pressure plate 18, so that the latter is operated through the wall of the rubber tube.

A cover 21, shown in Figure 2, is rectangular in shape and consists of inextensible material which along the two longitudinal edges which are in juxtaposition when the cover is around the bladder 1, is provided with adjustable fastening means in the form of tape 22. It may be expedient instead of tape 22 to use straps and buckles whereby the adjustments may be readily made to the diameter of the cylindrical body which the cover forms, when it is in position around an inflated bladder.

For the purpose of effecting heat treatment, heating means may be provided, for example, between the bladder 1 and the cover 21. Furthermore the heating means for example electrical heating element 23 may be incorporated in the cover, as shown in Figure 2, said element 23 terminating in a supply lead 24 which may be connected to an electric current source, possibly including a variable transformer or variable resistance which, if it be desired, may be thermostatically controlled, in which case the cover also contains a thermosensitive control member.

When the apparatus is to be used, the cover

21 is placed around an inflated bladder 1, the adjustable fastening means 22 being assembled and adjusted to a value corresponding to the lordosis desired. The bladder may be inflated, for example by the use of the pumping device shown in Figure 3, to which it is connected by the conical end of the nipple 5 being inserted into the conical passage in the nipple 3 which is inserted in the rubber tube 2. The apparatus then is placed in position between the patient and a suitable support, for example, a couch or chair back, and the bladder is then inflated. When the bladder has been inflated to the desired degree of hardness, the rubber hose 2 is compressed and the nipple 5 removed from the nipple 3 and substituted by the plug 4.

If a dynamic treatment of the patient be desired, the pumping device is left connected with the bladder. The patient can then himself inflate the bladder which is in position for treatment, and thereupon by exerting pressures on the operation member 10, release air from the bladder and inflate it once more by means of the bag 11, so that his back is subjected to a kind of massage. Such treatment can contribute to altering for example the internal pressure conditions which keep discus intervertebralis forced out in an incomplete or only threatening prolapse.

The invention is, in the foregoing, described with reference to the rather diagrammatical embodiment shown on the drawing, but it is obvious that the invention may be applied in connection with other embodiments, for example where the bladder 1 itself is in a cylindrical shape, or where a special adjustment device is provided which permits the maximum diameter of the treatment apparatus to be adjusted after the inflation.

What I claim is:—

1. Apparatus for static or dynamic treatment of the spinal column and for supporting the spinal column in its normal curved position comprising an inflatable bladder, consisting of a gas impermeable material and provided with air supply means, and a cover of an inextensible material provided with means for adjusting the diameter of the substantially cylindrical body formed when the bladder is inflated.

2. Apparatus according to claim 1, wherein the air supply means includes a valve adapted only to allow the entry of air into the bladder.

3. Apparatus according to claim 2, wherein

the valve is adapted to allow for the controlled release of air from the bladder.

4. Apparatus according to claim 3, wherein the valve comprises a cylindrical body of a rigid material, a flexible tube snugly fitting within said body and adapted to close a hole in the outer tube, an opening member mounted in the body and adapted to move the flexible tube out of contact with the inner wall of the body, thereby opening the hole therein.

5. Apparatus according to claim 3, wherein the valve is in the form of a ball valve.

6. Apparatus for treatment of the spinal column comprising an inflatable bladder consisting of gas impermeable material and provided with air supply means, and a cover of an inextensible material provided with means for adjusting the diameter of the substantially cylindrical body formed when the bladder is inflated, the bladder being in communication with an inflating means, e.g. a bellows, adapted to be manually actuated.

7. Apparatus according to any one of the preceding claims, wherein the cover is formed by a piece of substantially inextensible fabric, for example stiff linen, adapted to surround and substantially to encase the bladder, and which at adjacent edges is provided with adjustable fastening means.

8. Apparatus according to claim 7, wherein the adjustable fastening means are formed by cord holes with cords passing through them.

9. Apparatus according to claim 7, wherein the adjustable fastening means consists of buckles along one edge and straps along the other edge.

10. Apparatus according to claim 7, wherein the adjustable fastening means consists of tape along both edges.

11. Apparatus as claimed in any of the claims 1—10, characterised by a heating element formed integral with the cover, for example consisting of electric resistance wires woven into the cover and connected to adjusting means, for the adjustment of the heat yield.

12. Apparatus substantially as described hereinbefore with reference to the accompanying drawing.

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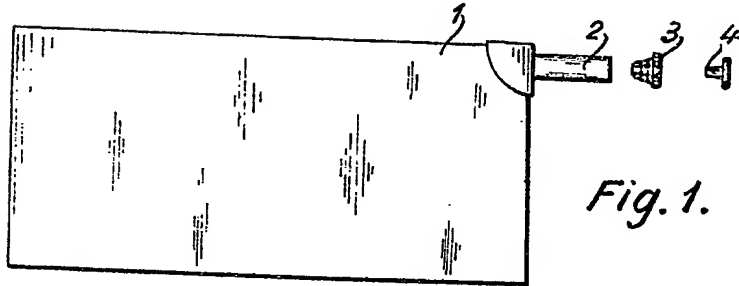


Fig. 1.

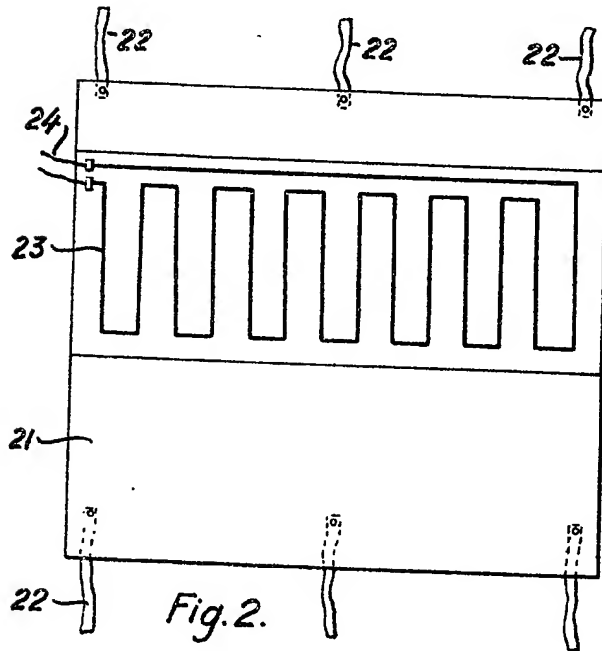


Fig. 2.

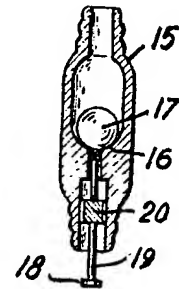


Fig. 4.

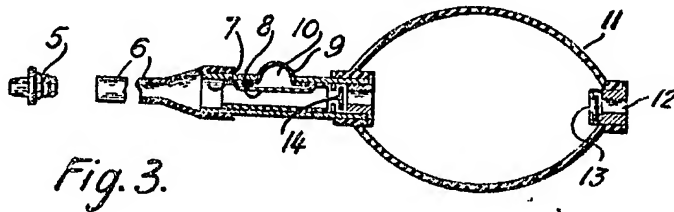


Fig. 3.